Outdoor UAVs Control and Coordination System

I. Budinská, J. Zelenka, T. Kasanický,

Institute of Informatics / Slovak Academy of Sciences, Dúbravská cesta 9, 84507, Bratislava, Slovakia

e-mail: {ivana.budinska,jan.zelenka}@savba.sk, kasanicky@neuron.tike.sk

INSTITUTE OF INFORMATICS SLOVAK ACADEMY OF SCIENCES

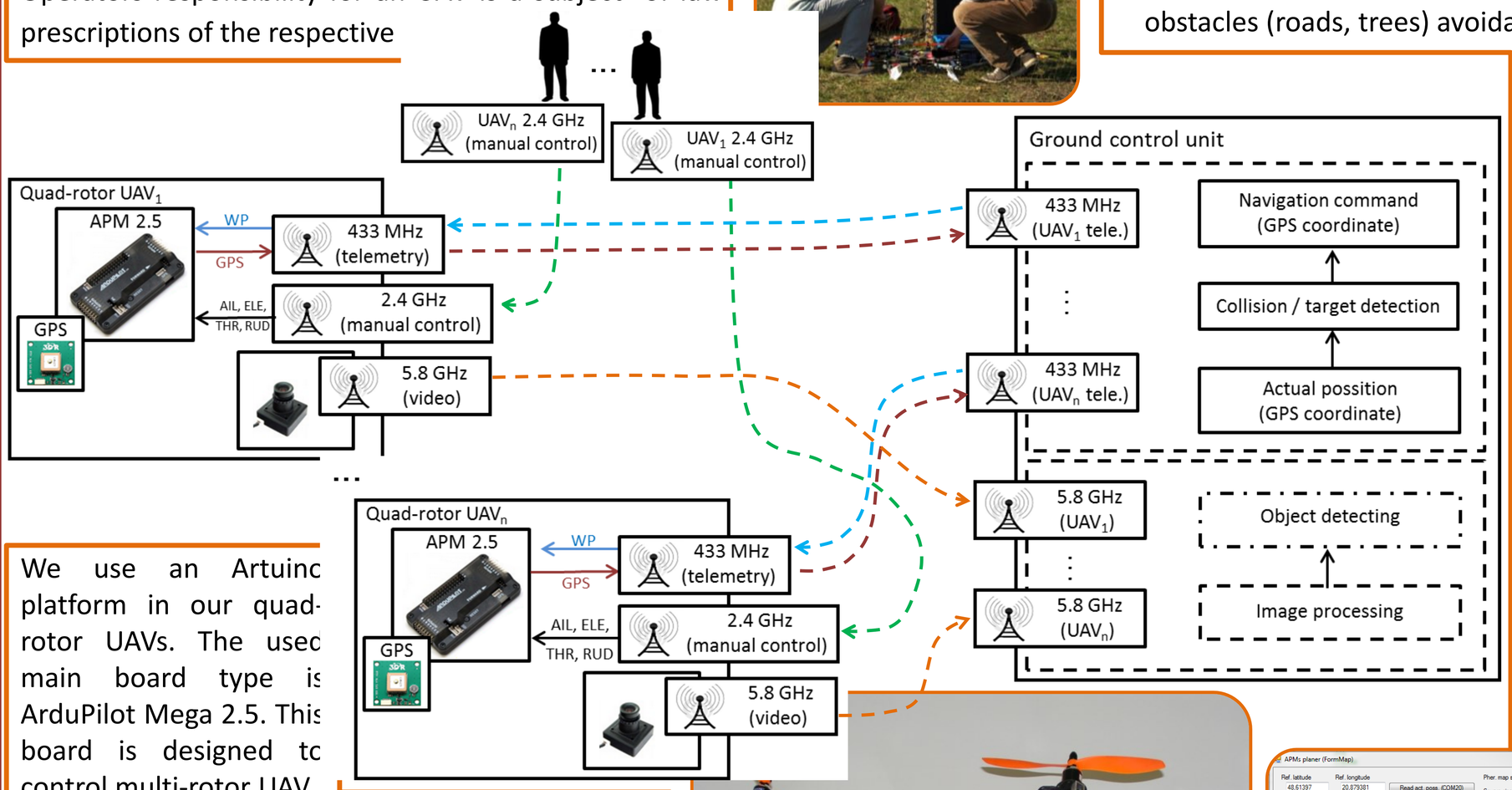
SLOVAK RESEARCH AND DEVELOPMENT AGENCY

BioMRCS, APVV 0261-10

VEGA 2/0197/10

Block architecture of the testing system

A human operator ensures safe operation of UAVs. Operator's commands have the highest priority. Operators responsibility for an UAV is a subject of law prescriptions of the respective

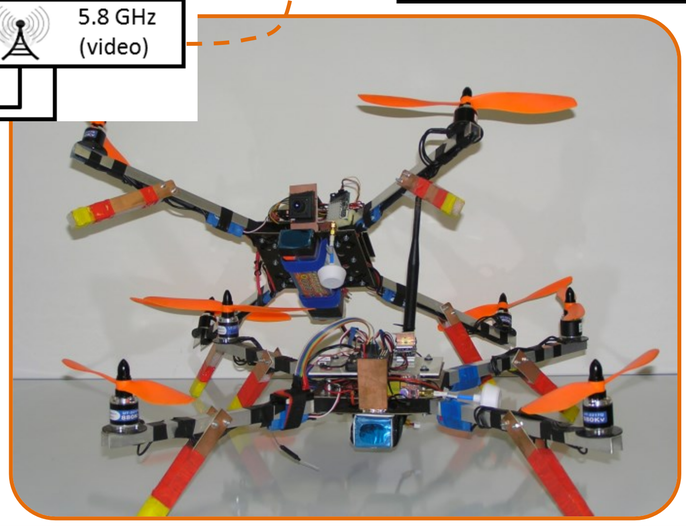


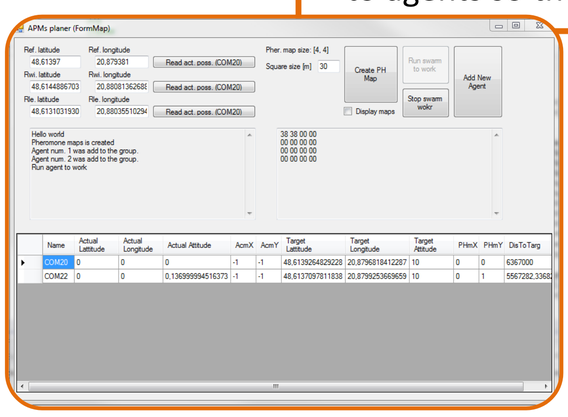
The ground control unit tool enables:

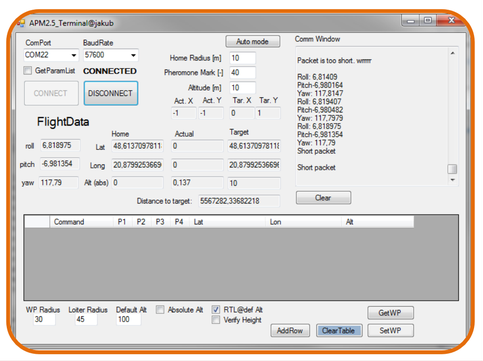
- *to divide an area to virtual cells*: An area is defined by three GPS points in such a way that UAVs do not influence traffic safety or safety of the population during testing. Positions of the GPS points determine shape of cells (square or trapezoid). By creating cells of an appropriate shape we can better control obstacles (roads, trees) avoidance.
- *to connect individual agents*: The software ensures duplex communication between an agent and a ground control unit. Information about agents (such as the UAV tilt or actual GPS coordinate) are continuously collected. If a target point is reached the tool calculates and sends a new target point. In our case an agent represents a single quad-rotor UAV. It is possible to connect other type of agents but it must be compatible with a MAVLink protocol and must be able to navigate to a GPS waypoint;
- *to monitor continuously mutual agents positions*: If agents distance is below a reference value the tool begins to resolve the conflict - starts sending the GPS coordinates to agents so that they can avoid a collision.

We use an Artuinc platform in our quad-rotor UAVs. The usec main board type is ArduPilot Mega 2.5. This board is designed tc control multi-rotor UAV.

Sensors are integrated directly on the main board or external sensors (e.g. external GPS, magnetometer, compass (APM 2.6), ultrasonic rangefinder) can be also connected. Open-source software from DIY Drone is used for the APM board. Software is uploaded through the Mission Planer interface. We used the V 2.8 Quad firmware of APM control board for testing.

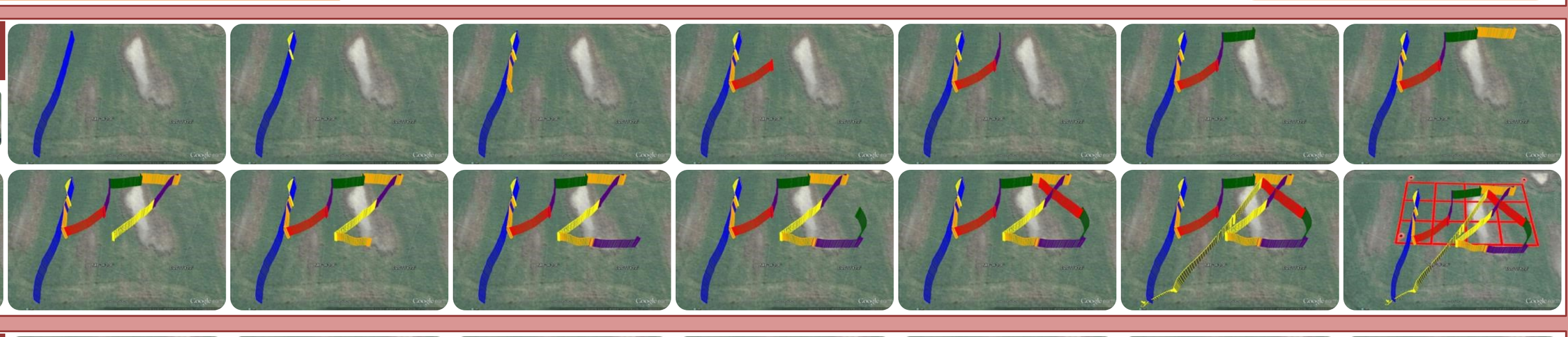






Test$_1$ with 1 UAV

Test area: 3x4 cells
Dimension: 30x30 m
Explor. time: 343 sec.

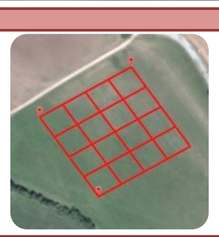


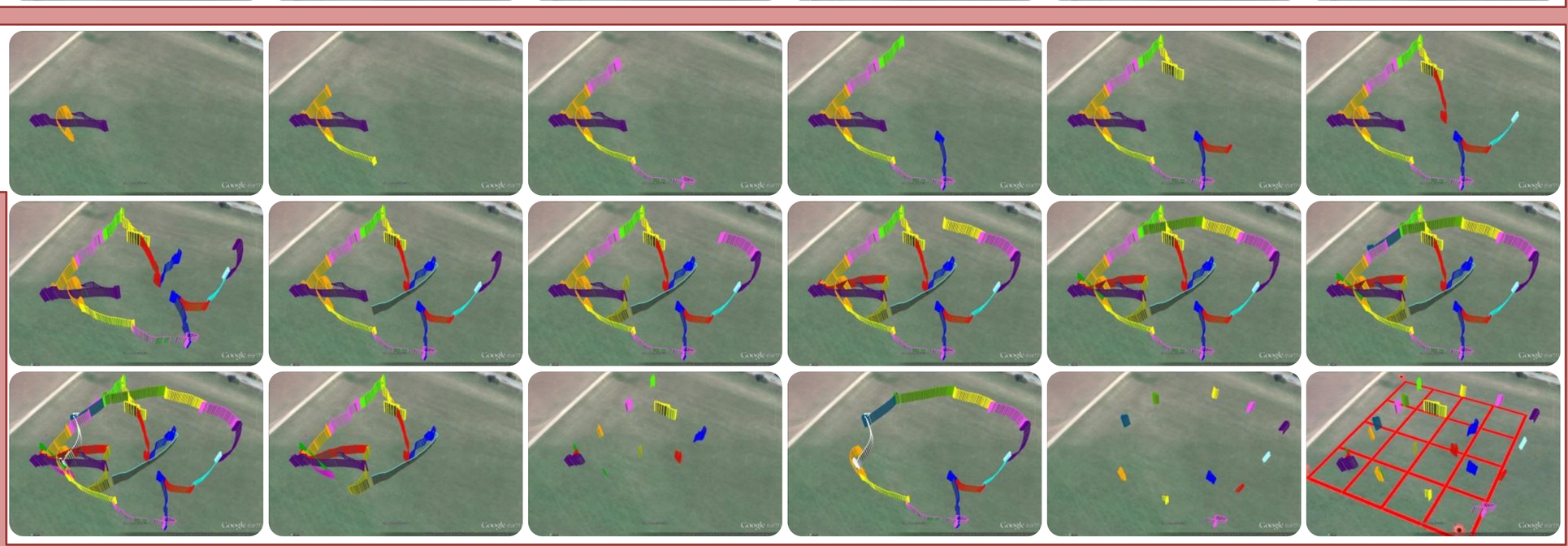
Test$_2$ with 1 UAV

Test area: 3x4 cells
Dimension: 30x30 m
Explor. time: 609 sec.

Test$_3$ with 2 UAV

Test area: 4x4 cells
Dimension: 30x30 m
Explor. time: 345 sec.





Crashes